METHOD AND CIRCUIT ARRANGEMENT FOR THE OPERATION OF AN ELECTRIC GAS DISCHARGE LAMP

Background of the Invention

1. Field of the Invention

The invention is directed to a method for the operation of an electric gas discharge lamp, e.g., of an UV low-pressure tube, in artificial sunning and irradiation devices and to a circuit arrangement for carrying out the method.

2. Description of the Related Art

It is known, for example, that the light output or radiation output of UV low-pressure tubes used for artificial sunning and irradiation decreases already after a relatively short operating duration (total operating duration) to the extent that they must be replaced by new UV low-pressure tubes; otherwise, in the case of sunning, the expected results of irradiation would inevitably lead to unacceptably long - and constantly longer - periods of use. However, it is also known with respect to other electric gas discharge lamps emitting UV radiation and/or normal light radiation that their light output or radiation output decreases more or less rapidly in operation. The necessary exchange consequently gives rise to considerable costs particularly as applies to the above-mentioned case of UV low-pressure tubes whose price is several times that of normal lighting tubes(fluorescent tubes).

In order to prolong the operating duration of the relatively expensive UV low-pressure tubes mentioned above, which is usually approximately 500 hours, attempts have already been undertaken in the area of the electric or electronic ballast devices required in these gas discharge

lamps such that a switching of the electric output emitted at the gas discharge lamp is carried out manually in such a way that in case of a light output or radiation output of the gas discharge lamp (that is, the UV low-pressure tube in the present example) which is already dropping sharply, the electric output to be supplied is increased suddenly by a larger amount, so that a light output or radiation output of the gas discharge lamp which corresponds more or less precisely to that at the beginning of use is obtained again.

A device for checking and displaying the remaining operating duration of xenon lamps is known from U.S. Patent 4,831,564, which device comprises a housing which uses a new, unused xenon lamp. The xenon lamp then emits its light via a surrounding filter. A sensor by which the light emission or radiation emission of the xenon lamp is checked is located in the housing. When the light output or radiation output of the xenon lamp decreases, the sensor controls a regulator which increases the electric output supplied to the xenon lamp, so that the xenon lamp always delivers a constant light output or radiation output. The values determined during this checking for the required power consumption of the xenon lamp are stored. Based on the values stored for different types of xenon lamps, it is possible to determine the remaining life or operating duration of a new xenon lamp, but also particularly that of a xenon lamp which is already used. The total period of use (total operating duration) of a gas discharge lamp is not influenced for achieving an extensively constant light

output or radiation output in this case. (Accordingly, a closed regulating loop is used for determining the required power consumption at constant light output or radiation output.)

Summary of the Invention

Therefore, it is the object of the invention to considerably lengthen the total useful period (total operating duration) of a gas discharge lamp in the simplest and most economical manner without resulting in factors interfering with practical useful operation - for example, with respect to UV low-pressure tubes - such as excessively long and/or more or less sharply fluctuating treatment or sunning times.

In order to meet this object, the following features ~~indicated in the characterizing part of claim 1~~ are suggested:

The use of the method according to the invention makes it possible to operate electric gas discharge lamps, e.g., such as UV low-pressure tubes, over a considerably longer time period compared with the previously known mode of use, namely, at least essentially always at that light output or radiation output which was predetermined individually and, of course, within the framework of the technical possibilities of the gas discharge lamps in question. Consequently, considerable costs can be saved, e.g., precisely in the operation of solaria, through improved utilization of the UV low-pressure tubes which are usually used therein, without becoming noticeable in a disadvantageous manner through more or less sharply fluctuating treatment or sunning periods.

Further advantageous constructions of the inventions and ~~a~~ the circuit arrangement for carrying out the methods are disclosed in the dependent claims ~~2 to 17~~ and the following description.

With respect to the characteristic data of a gas discharge lamp, it is noted that by this is meant especially the decrease in light output or radiation output depending on the total operating duration of the individual gas discharge lamp, wherein this is known, for example, from the manufacturer's specifications; however, other dependencies of the light emission behavior or radiation behavior of the respective gas discharge lamp, e.g., the temperature of the surroundings in which the gas discharge lamp is operated, can also be included herein. Further, with regard to the UV low-pressure tubes mentioned above or other gas discharge lamps, the electric or electronic data of the electric or electronic ballast device used in this case are pertinent and can be incorporated in the control process or in the regulating process with respect to the light or radiation emitted by the gas discharge lamp in question.

Further, the claims - whose content will, without further explanation, be readily understood by the person skilled in the art taking into account the problem and objective outlined above and the inventions indicated for the solution thereof - are hereby also expressly incorporated in the subject matter of the description. However, it should be noted in addition that because of its technical simplicity and efficacy in a relatively economical possible realization, the solution

according to the invention according to method claim 1 or circuit arrangement claim 9 can be used in a particularly advantageous manner for solving the problems indicated above.

Brief Description of the Drawing

The invention will be explained more fully in the following with reference to an embodiment example shown in the drawing.

Description of the Preferred Embodiments

This drawing shows a block diagram, as it is called, of a control circuit which first includes a control device 1 constructed as a processor. This control device 1 is supplied with a usual voltage, for example, 220 V, via a line 2. A plurality of, for example, ten, compensation characteristic lines of commercially available gas discharge lamps, for example, UV lamps 3 which are used in a UV irradiation device 4, for example, for the human body and parts thereof, are stored in the control device 1.

UV lamps 3 of this kind have the peculiarity that the UV output power, as it is called, decreases relatively sharply as the burning or operating duration increases. For example, after an operating duration of approximately 500 hours, the UV output power is reduced by approximately 30%. This reduction is unsatisfactory and, although the UV lamps 3 are actually still usable, leads to an exchange and therefore to a production of extra waste. Further, UV lamps 3 of this kind are relatively expansive.

A plurality of electronic ballast devices 5a - 5e assembled in a block are arranged between the UV irradiation device 4 and its UV lamps 3, wherein one ballast device 5a to

5e is associated with each UV lamp 3. It is also possible to provide a ballast device 5a supplying two or more UV lamps 3. The ballast devices 5a - 5e are connected to a current supply line 6. Depending on identical or different types of UV lamps 3, the electronic ballast devices 5a - 5e are controlled in such a way, via one of more compensation characteristic lines stored and selected in the control device 1, that always a current intensity of this kind, but an increasing current intensity, for supplying the UV lamps 3 is supplied to the individual or selected UV lamps 3 such that the latter always emit a uniform UV output power. This approximately constant output power can apply either at the full output of the UV lamps 3 or at an output which is reduced within certain limits, wherein in the latter case the operating duration of the UV lamps 3 is increased. For example, it is possible to use UV lamps 3 with a higher, normally impermissible UV radiation intensity which only emits a reduced, but extensively constant, UV output.

The light output or radiation output actually emitted by one or more gas discharge lamps 3 at a given time can be measured via at least one sensor 7 and compared with a reference value stored in a unit 8. In case of deviation from the reference value, this is conveyed to the control device 1 which then influences the electronic ballast devices 5a to 5e in a corresponding manner.

It is possible to measure the temperature in the area of the gas discharge lamps and/or of the surrounding air which

disadvantageously impairs the work of the gas discharge lamps and to supply this to the control device 1 as a correction value.

The control signals supplied to the ballast devices 5a - 5e by the control device 1 can be modulated digitally as well as in analog with respect to current, voltage or frequency. A reset switch 9, as it is called, which is actuated for restarting after the exchange of the gas discharge lamps 3 is associated with the control device 1.